

## CLAIMS

- 1 1. A photonic bandgap microcavity comprising:
  - 2 a membrane structure that can experience strain; and
  - 3 a photonic bandgap waveguide element formed on said membrane structure
  - 4 having a defect so that when said membrane structure is strained, said photonic bandgap
  - 5 waveguide element is tuned to a selective amount.
- 1 2. The photonic bandgap microcavity of claim 1, wherein said membrane structure  
2 comprises a sub-micron SiO<sub>2</sub> layer.
- 1 3. The photonic bandgap microcavity of claim 1, wherein said photonic bandgap  
2 waveguide element comprises a 1-dimensional photonic crystal.
- 1 4. The photonic bandgap microcavity of claim 3, wherein said photonic bandgap  
2 waveguide element comprises a plurality of periodic holes.
- 1 5. The photonic bandgap microcavity of claim 4, wherein said defect breaks the  
2 periodicity of said periodic holes.
- 1 6. The photonic bandgap microcavity of claim 1, wherein said selective amount  
2 comprises approximately 1%.
- 1 7. The photonic bandgap microcavity of claim 1 further comprising at least one actuator  
2 that is coupled to said membrane so as to produce said strain.
- 1 8. The photonic bandgap microcavity of claim 7, wherein said at least one actuator  
2 produces strain on said membrane between 0.2 and 0.3%.

- 1 9. The photonic bandgap microcavity of claim 7, wherein said at least one actuator
  - 2 comprises a top electrode.
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- 1 10. The photonic bandgap microcavity of claim 9, wherein said at least one actuator
  - 2 comprises a bottom electrode.
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- 1 11. The photonic bandgap microcavity of claim 7, wherein said at least one actuator
  - 2 comprises a PZT piezoelectric actuator.
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- 1 12. A method of forming a photonic bandgap microcavity comprising:
    - 2 providing a membrane structure that can experience strain; and
    - 3 forming a photonic bandgap waveguide element on said membrane structure
  - 4 having a defect so that when said membrane structure is strained, said photonic bandgap
  - 5 waveguide element is tuned to a selective amount.
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- 1 13. The method of claim 12, wherein said membrane structure comprises a sub-micron
  - 2 SiO<sub>2</sub> layer.
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- 1 14. The method of claim 12, wherein said photonic bandgap waveguide element
  - 2 comprises a 1-dimensional photonic crystal.
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- 1 15. The method of claim 14, wherein said photonic bandgap waveguide element
  - 2 comprises a plurality of periodic holes.
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- 1 16. The method of claim 15, wherein said defect breaks the periodicity of said periodic
  - 2 holes.

1 17. The method of claim 12, wherein said selective amount comprises approximately  
2 1%.

1 18. The method of claim 12 further comprising providing at least one actuator that is  
2 coupled to said membrane so as to produce said strain.

1 19. The method of claim 7, wherein said at least one actuator produces strain on said  
2 membrane between 0.2 and 0.3%.

1 20. The method of claim 7, wherein said at least one actuator comprises a top electrode.

1 21. The method of claim 9, wherein said at least one actuator comprises a bottom  
2 electrode.

1 22. The method of claim 7, wherein said at least one actuator comprises a PZT  
2 piezoelectric actuator.